PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Applicants	:	Daniel Richard Schaefer, et al.
Serial No.	:	09/996,244
Filed	:	November 28, 2001
Title	:	TRAPPING AND STORAGE OF FREE THERMAL NEUTRONS IN FULLERENE MOLECULES
Docket	:	594826-001C1
Art Unit	:	3641

SECOND DECLARATION OF JOSEPH W. TALNAGI under 37 C.F.R. §1.132

I, Joseph W. Talnagi, declare and state the following:

I am the same Joseph W. Talnagi who executed the Declaration under 37 C.F.R. §1.132 of Record in U.S. Application Serial No. 08/376,846 filed January 23, 1995 entitled Trapping and Storage of Free Thermal Neutrons in Fullerene Molecules.

I have carried out the procedures outlined at pages 7-10 of the current application wherein a fullerene sample is placed in a neutron flux within a nuclear reactor and irradiated at a steady-state thermal power between 10 and 500 kilowatts for a period of about 5 to 15 minutes, and I have obtained fullerene samples exhibiting a beta emission with a half life of about 10 minutes ± one minute.

I understand that the Board of Patent Appeals and Interferences has taken the position that the results reported in the application do not establish that the beta emission is, in fact, caused by thermal neutrons trapped within the central cavity of a fullerene molecule and that the beta emission may be attributed to other sources. I understand that the Board affirmed a rejection of the application under the first paragraph of 35 U.S.C. §112 stating that:

> "However, the appellants have not submitted evidence to establish that the beta emitters in the fullerene molecule are not in fact other pure beta emitters."

In order to verify that that the beta emission that I observed is not the beta emission of another beta emitter, using the 75th edition of the CRC Handbook of Physics and Chemistry I identified those beta emitters having a half-life in the range of 6.0 to 15.0 minutes as follows:

143 La, 179 Yb, 191 Re, 195 Os, 212m Bi, 213 Pb, 215 Bi, 222 Fr, 226 Rn, 256 Cf, 78 Br, and 49 Ca

If any of these isotopes was responsible for the beta emission I observed, the isotope itself or a sister isotope would be detectable in the fullerene molecule. However, the fullerene used for the experiment was carefully analyzed and none of these isotopes or their sister isotopes was present. Further, of the listed radioactive forms, only 49Ca is produced by direct capture of a thermal neutron, and I saw no evidence of its presence in the samples in the form of its characteristic gamma emissions. Accordingly, the only beta emitter that I have been able to identify that would produce the beta emission I observed for the fullerene is a thermal neutron.

I am also familiar with the Board's statement that the application is defective because:

> "A person of ordinary skill in the art would not be enabled by the appellants' disclosure to ensure that even if thermal neutrons are the pure beta emitters, these thermal neutrons are in fact within the fullerene molecule rather in the sample outside the fullerene or bonded to the fullerene itself."

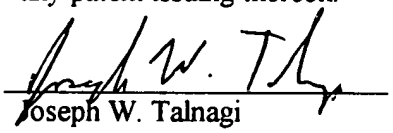
The issue that the Board raises is not viable because a thermal neutron would be incapable of producing a beta emission having a half life of approximately 10 minutes unless it is present in the sample as a free thermal neutron. A neutron removed from the confines of an atomic nucleus is unstable. Given the small sample size, the velocity of a thermal neutron, and its mean free path in the materials composing the test samples, a neutron will either escape from the confines of the sample and thereby be lost to detection, or it will interact with the nuclei of the atoms forming the sample. This interaction can result in elastic scattering, inelastic scattering, or absorption. Scattered neutrons will either leak from the sample and be lost, or continue to scatter until they are absorbed. It is unlikely that a free thermal neutron

would externally attach itself to an atom or molecule in a manner analogous to a chemical bond. Once a thermal neutron is captured within an atomic nucleus, the neutron is no longer a "free" neutron and it is no longer able to produce a beta decay having the characteristic half life of a free neutron. That fullerene molecules produce a beta decay having the half life of free neutrons is a unique feature of the invention described in the application.

In an experiment of the nature I performed, given the materials used, the most likely location that a thermal neutron could reside and exhibit the characteristic half life of a free neutron is within the central cavity of a fullerene molecule. In all other likely interactions, the thermal neutron would either be absorbed by the atomic nuclei which this would render the thermal neutron incapable of decaying with the characteristic half life, or escape from the sample and thus not be detectable by its beta decay.

Based upon the foregoing analysis, a person skilled in this art would conclude that the applicants have captured a thermal neutron in the central cavity of the fullerene molecule.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed by:  On: June 17, 2002

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